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ABSTRACT

Secondary students in Tasmania, Australia, can develop their skills in social studies and geography by solving the problems involving map use that this resource book provides. Several different types of maps are covered including: building plans, sketch maps, contours maps, world-grids, atlases, and urban maps. (DB)

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A COURSE TO UNDERSTAND MAPS

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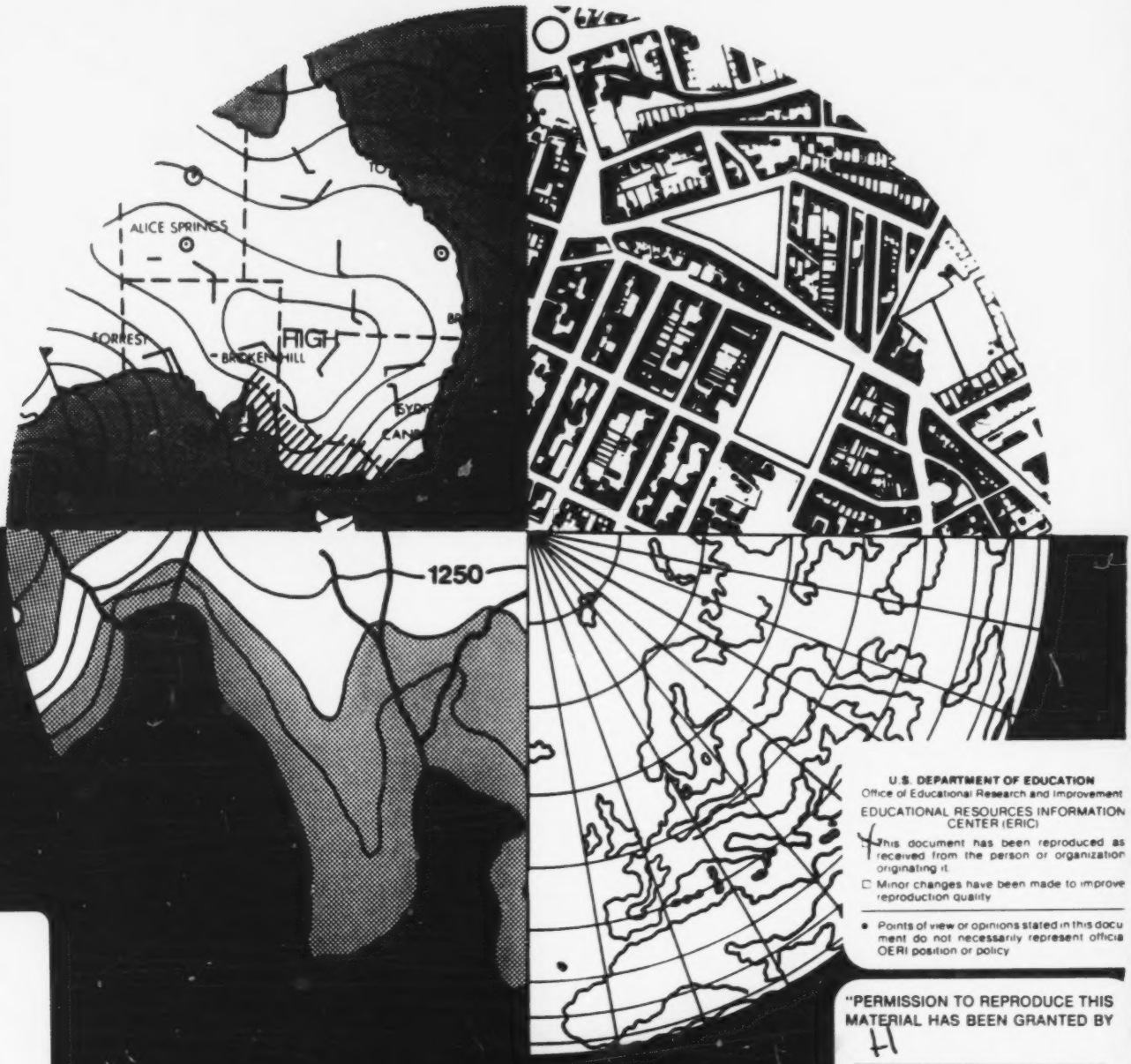

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A COURSE TO UNDERSTAND MAPS

E. A. Winter, B.Sc. (Econ.), B.Ed.,

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Education Department Tasmania Australia

INTRODUCTION

School studies in geography are enriched by skills in creating and interpreting maps and in using atlases competently. The purpose of this book is to develop these skills by presenting a series of problems for students to solve.

I have tried to create a basis for work at the secondary level and I think teachers will find the coverage wide enough and the depth adequate. The exercises themselves provide motivation for most students and many will proceed through the work with very little help.

E.W.

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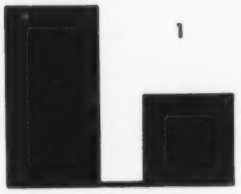
BUILDING PLANS

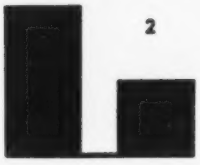
This book is about maps of many kinds and you will learn about them through solving problems. A very simple kind of map is a plan of a building and on this will the first problems be based. In the first column opposite are drawings of six buildings and in the end column are six plans. A plan shows the shape of the building as it would appear from the air.

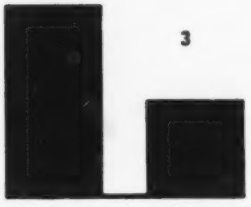
Choose from the six the plan belonging to the building at the top of the column and draw the plan carefully in the space alongside. Now choose the plan for the second building and continue until you have matched each building with its proper plan.

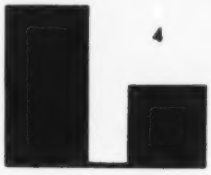
The shape of the plan of a building will always be the same though its size may change. The size of the plan depends on whether it has been drawn to a large or small scale. At the bottom of this page is a sketch of a group of buildings together with five plans of those buildings. Each of the plans has been drawn to a different scale.

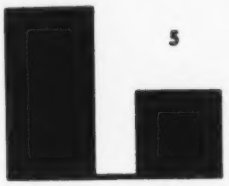
Measure the plans carefully. Write A above the largest, B above the next and so on down to F the smallest. Check your answers on page 34.

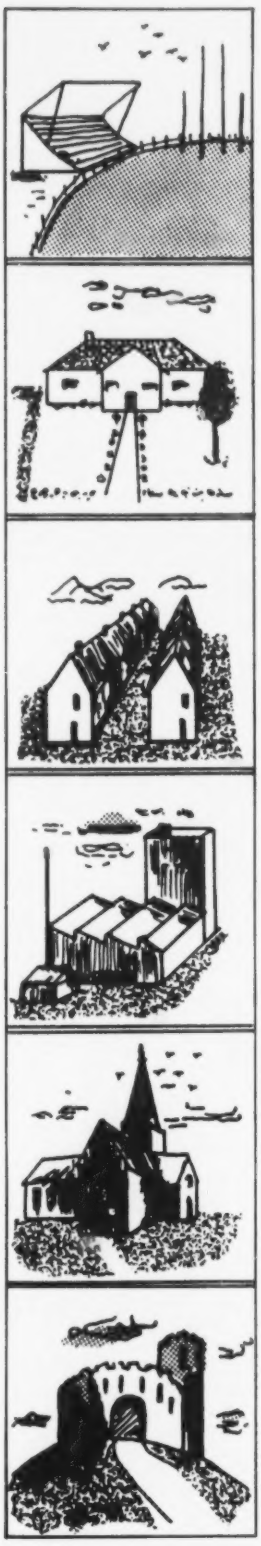












1.
2.
3.
4.
5.
6.

Check your answers on page 34

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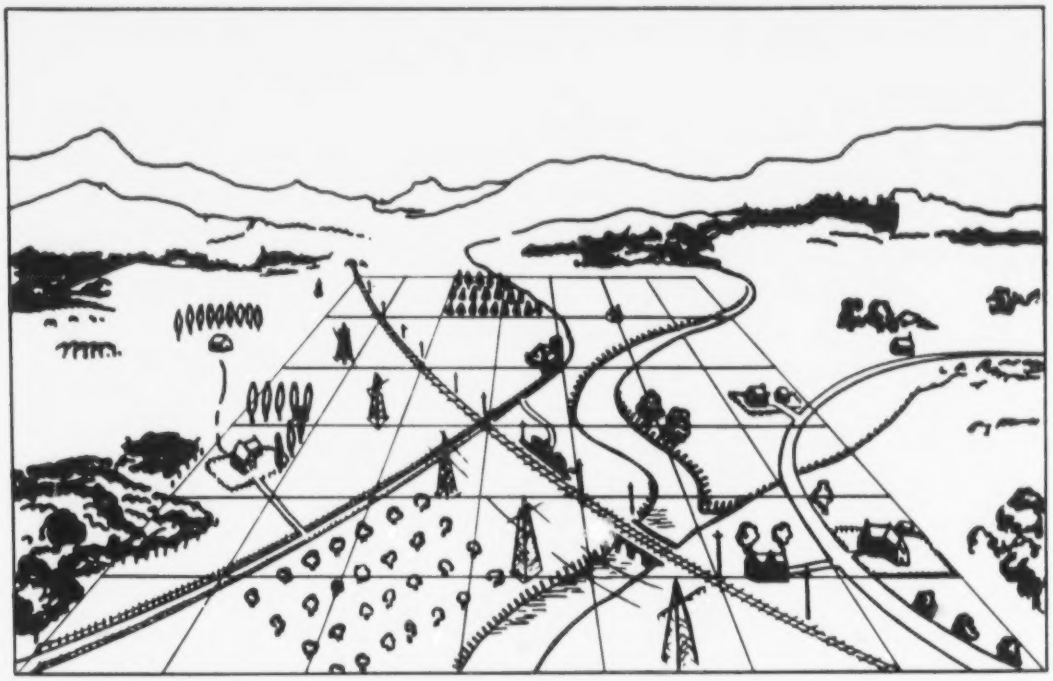


What is a Map ?

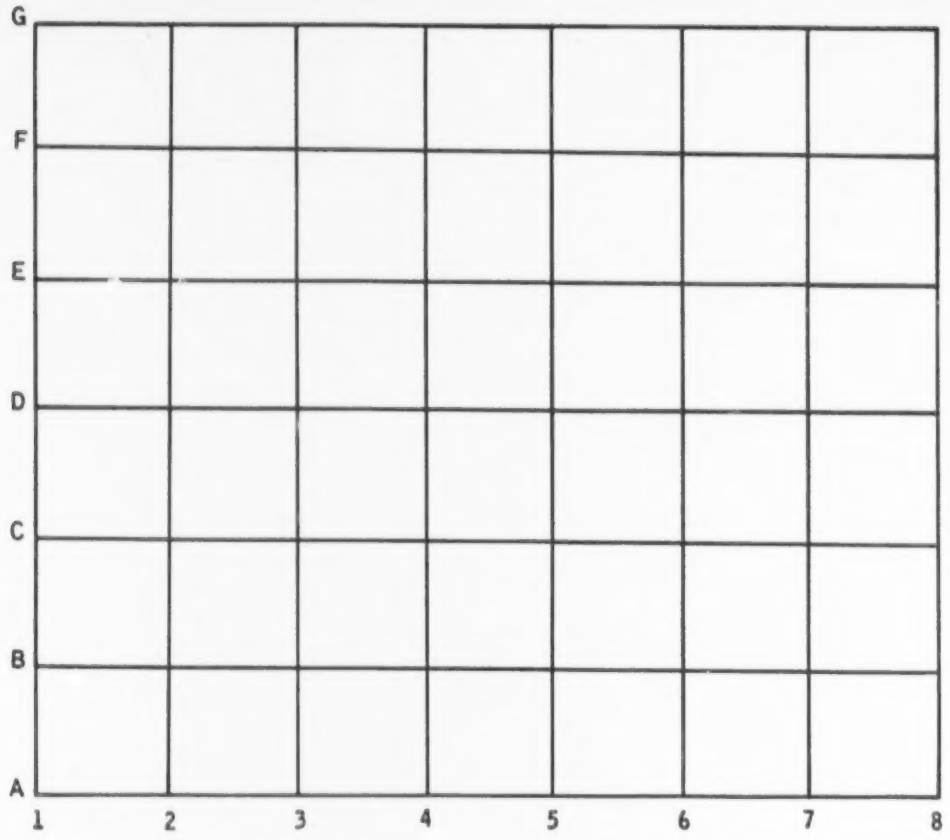
The best way to answer the question is to make one.

Notice that part of the land in this sketch has been marked off in squares. This has been done as a guide to making a map on the opposite page.

1. Find the railway and mark its course on the squares on the opposite page. It starts at 7 on the bottom line and runs in a *straight* line to the top left-hand corner of each square through which it passes. Mark it first in pencil then in ink.
2. The main road starts in the bottom left corner and runs straight to where lines E and 5 meet, then it turns to where F and 5 meet and goes off the map at G/4. Draw this main road in red and other roads brown.
3. The river enters the map between E/8 and F/8 and goes off between A/4 and A/5. Plot its course in pencil with care using the squares in the sketch as a guide. Colour both river and tributary lightly in blue.
4. Where the railway crosses the road draw the sign for a level crossing and where it crosses the river the symbol for a bridge should be drawn like this:
5. Mark the position of each electricity pylon with a green cross and join each with a line representing the wire. *Keep the crosses all the same size.*
6. All buildings should be marked in the correct position with a block in black. The station has a block with Sta. written alongside it. The church is shown like this:
7. Show woodland with green dots; Orchards with purple dots;
   Pine plantations with green triangles; A tree is green like this:

Notice the first thing about a map – objects are shown by symbols.

This sketch shows 800 metres of the railway line. Measure it on the map and you will find that it is 16cm long. One cm on the map then represents 50 metres on the land.



SCALE : 1 cm. represents 50 m.

Use a ruler to measure on the map the distance in a straight line between the following places and write in the distance below, remembering 1cm = 50m.

1. Church and railway station .....m
2. The house on the left to the road .....m
3. The house by the railway bridge and the church .....m
4. The house by the railway bridge and the house on the left .....m
5. The distance between any two electricity pylons .....m
6. If the orchard on your map measured 3cm x 4cm, what is its area on the ground? .....m

The second thing about a map is that is is drawn to scale and distances can be measured.

Notice the position of the church on the map is E/5. Write the position of:

1. The house at the top .....
2. The level crossing .....

These are called map references and the third thing to remember is that maps have a method of reference to places.

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Direction

The fourth point about maps is that *they show direction.*

As a reminder of the way directions lie a compass-card has been drawn. The initial letters represent words as follows:

N :	North	E :	East	E.S.E. :	East-south-east
S :	South	W :	West	N.N.W. :	North-north-west

A cross-country race is being held by a school. The start is marked "S" on the opposite page. At each place where the runners turn a small compass has been drawn to help you get your bearings. Notice the scale and the direction of North. From the start the course goes for a kilometre to the West where there is a church. Draw a dotted line for the course and a symbol for the church. At the church the course turns N.E. to a wood 500m away. Draw the dotted line and put in a symbol for the wood. Now complete the rest of the course following these directions. *Make up symbols if you don't already know them.*

1. From the wood 750m N.W. to a quarry.
2. From the quarry 500m E.S.E. to a school on the main road.
3. From the school 250m N.N.W. to a railway signal box.
4. From the signal box 500m E.S.E. along an embankment to a bridge.

As well as being marked in the points of the compass the card also shows degrees beginning from North which is 0°. Direction can be given in degrees and this is called 'bearing'. The next four points are given in this way and the course can now be plotted to the finish. *(continued bottom of next page)*

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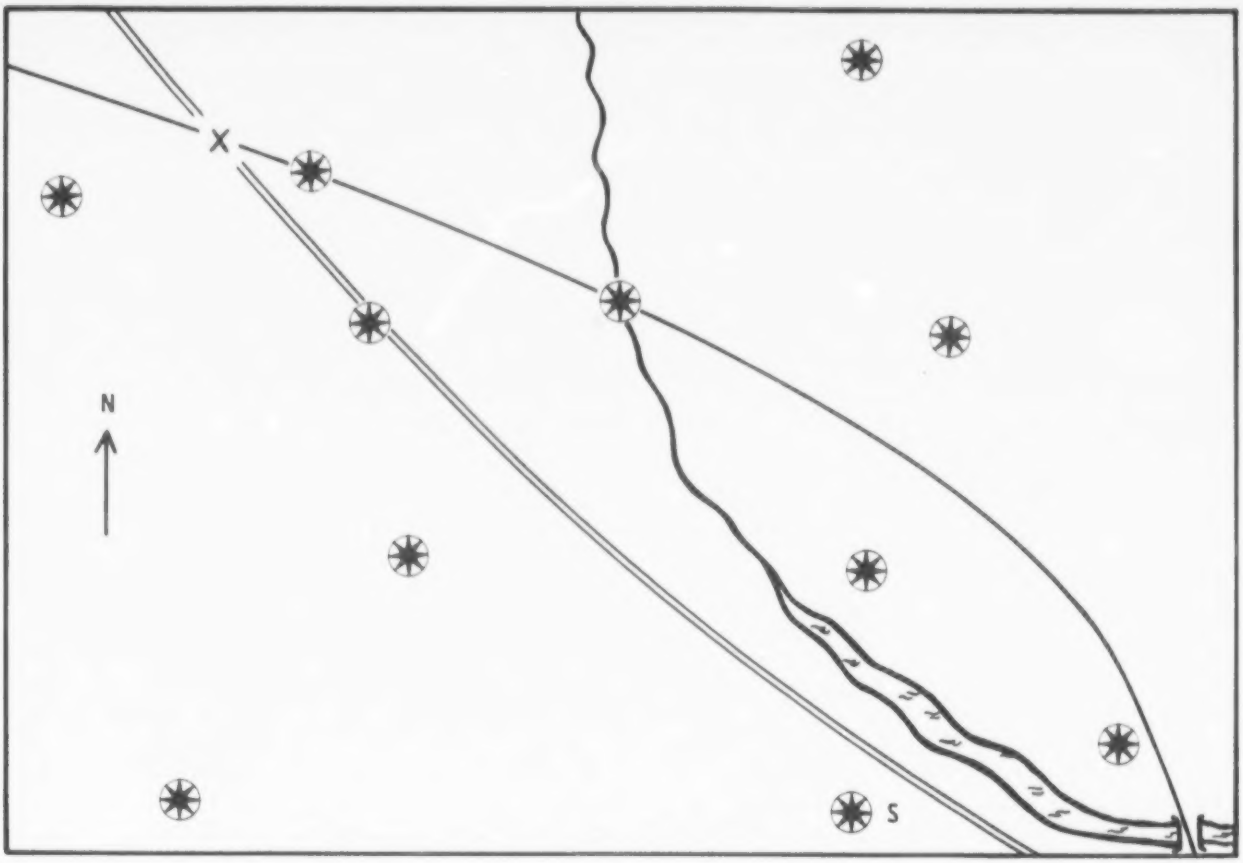
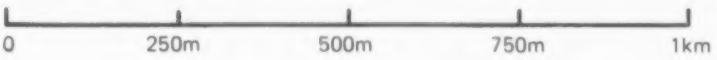
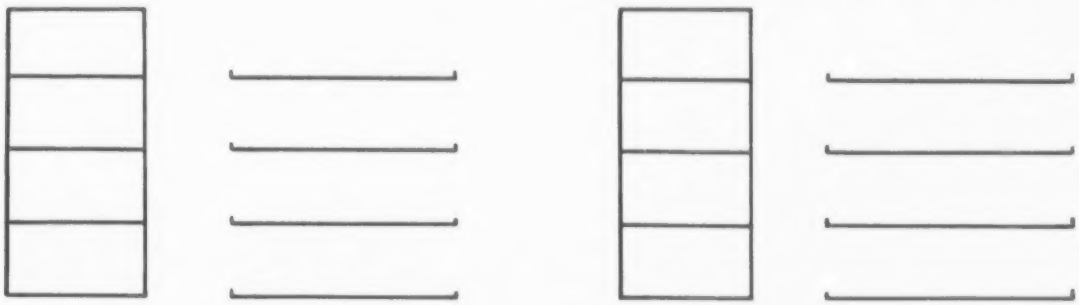


SCALE :



KEY



5. From the bridge 500m, bearing 45°, to a swamp.
6. From the swamp 750m, bearing 180°, to a farm.
7. From the farm 375m, bearing 22½°, to a pond.
8. From the pond 625m, bearing 157½°, to the finish.

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Reading a Map

First complete this key with the symbols used in this map:

Churches	Signal Box	Pond .....
School	Railway Embankment	Marsh .....
Quarry	Lighthouse	Ferry Terminus .....

Map References

Notice that the straight lines on the map, called the grid, are numbered for reference. The end of the jetty has the reference 4/1 as the bottom number should be read first. To be more accurate we can imagine the space between the lines to be divided into tenths. The house marked 'Ho' will then have a map reference 2.5/1.5 or, as it is more usually given 2515. The quarry at the top is 6775 (6.7/7.5) and the railway station is 5040. Write the map references of the following:

The signal box ..... The school .....

The island ..... The railway bridges ....

Which objects are situated at these points ?:

6030	2667	5020 .....
1838	5523	5757 .....

Distance

To measure distance fairly accurately use a pair of compasses and set them at 250m, using the scale on the map, then walk them along the road counting every step as 250m. What are the following distances by road or track ?:

1. From the railway station to the quarry .....
2. From the railway station to the village (5560) .....
3. From the school to the house 'Ho' – (a) using the ferry .....
   (b) going by road .....

Direction

Measurements for direction are in a straight line, not along roads. What are the following buildings?

1. One km East of the farm 2030 ..... 2. Half a km North of the lighthouse .....

Land Use

1. By the river the land is not well drained and the paddocks are grass. These are their references, find them and colour them green:

(a)	1515	(e)	2545	(i)	2168	(m)	3070	(q)	4245
(b)	3020	(f)	2055	(j)	2075	(n)	3067	(r)	4535
(c)	3030	(g)	2550	(k)	1555	(o)	3060	(s)	5235
(d)	3040	(h)	2263	(l)	3078	(p)	3555		
and by the school		(t)	6545	(u)	6535				

   and the open spaces in the town.

2. The following are market gardens, find them and colour them purple:

(a)	5344	(c)	5348	(e)	5038	(g)	5055
(b)	5346	(d)	5350	(f)	5042	(h)	6045

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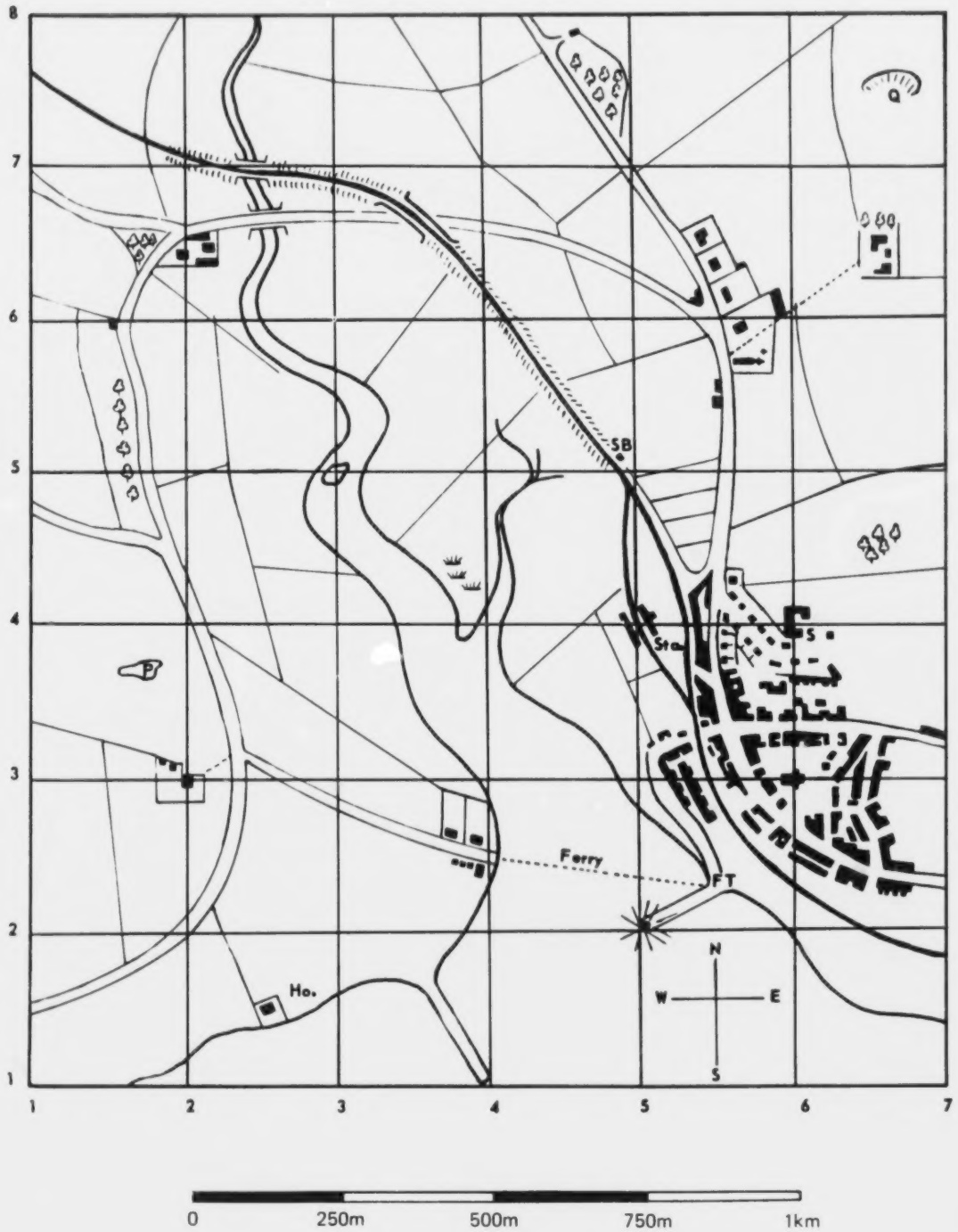
3. This is moorland (yellow):

(a)	6555	(c)	1525	(e)	1355	(g)	1575
(b)	6570	(d)	1540	(f)	1565		

4. The rest of the land is ploughed and should be brown.



Scale: 10cm represents one kilometre

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SKETCH-MAPS

Making sketch-maps is a way of making notes. Like notes they should be as brief and as clear as possible. For example, a lot of time would be wasted in drawing a map of Britain showing all the capes, bays and islands if the purpose of the map was simply to show the position of Birmingham.

The art of making sketch-maps can be learned very quickly and these are a few simple rules to follow.

Outlines of Maps:

1. Be as simple as possible, using only straight lines and simple curves.
2. Practise drawing each map a few times quickly.
3. Draw the lines of the outline in the same order every time.

Contents of Maps:

1. Use straight lines and simple curves to divide the map.
2. Use wavy lines to indicate rivers.
3. Use colours which are commonly used in the atlas, e.g. blue for rainfall.
4. Use contrasting colours to show different things, e.g. different countries.
5. Use harmonious colours to show increases in the same thing, e.g. yellow, orange and red showing increases in temperature.
6. Let the heaviest colour mean 'the most' and the lightest colour mean 'the least'.
7. Shading with open parallel lines is quickest and often the best.

The two sketch-maps opposite are examples which will prove the value of simple mapping. The first map is of North America. Shade in three contrasting colours the three countries shown in the map. Next, using an atlas, find the names of the rivers, towns, states and provinces which are numbered in the map. Write the names in the key.

Read again the rules on the contents of maps, then on the sketch-map of the world, show three different densities of population in the following way:

1. Examine an atlas map and decide which are the four areas of very dense population.
2. Show these areas in red, simply, on the sketch-map.
3. Show with light yellow the areas with the fewest people. (There are at least seven of them.)
4. Shade the remainder of the map in orange to indicate a population density which is in between the other two.
5. Give an approximate value to the colours by completing the key.

The map of Great Britain gives an opportunity to practise making simple and clear sketch-maps.

1. Using a ruler and with no more than six straight lines, try to separate the areas of highland and lowland. Then colour your highland areas yellow and the lowlands green.
2. Place a piece of tracing-paper over the map and on it simplify the outline of Great Britain into twelve lines, ten of which can be drawn with a ruler (see example). Next, locate with a dot and the initial letter, the cities of London, Edinburgh, Glasgow, Manchester and Dublin and the port of Holyhead. (You will get the information from an atlas map.) Finally, show the rail and ferry routes joining these places.

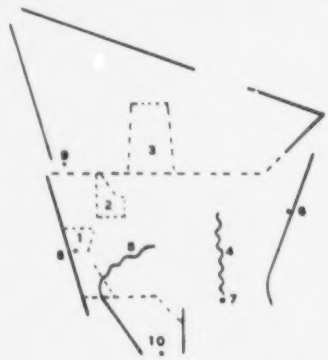
1 _____ 6 _____

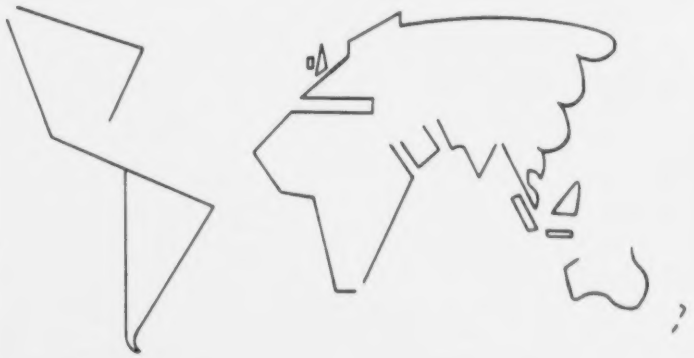
2 _____ 7 _____

3 _____ 8 _____

4 _____ 9 _____

5 _____ 10 _____





People to the square kilometre

more than _____

between _____ & _____

less than _____

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

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PRINTING ON MAPS

A lot of time can be saved and a lot of disappointment avoided by having some general rules for printing on maps and only departing from them for a very good reason.

Read this list of rules and see if you can think of others.

	General Rule	Exceptions
1.	Print rather than write.	Particularly clear handwriting.
2.	Use plain and simple letters.	None.
3.	Print words horizontally.	Sometimes to name rivers, mountains or other features.
4.	Begin place names immediately to the right of the place.	To avoid overcrowding an area of the map.
5.	Print above rivers and from left to right. Follow the course of the river.	None.
6.	Print the title at the top.	Sometimes to fill a large open space.

Here are some other suggestions which can help to create a map that can easily be read and with a good appearance.

1. When naming towns, rivers and other small features, write with a pen.
2. Locate towns with a red point.
3. When naming large areas, use BLOCK LETTERS. (Coloured pencils can also be used for large areas.)
4. Try to fill large spaces by laddering names, e.g.,

The
Great
Plains

The map opposite is of part of North America. Find this area in the atlas then, keeping the rules in mind, show on the map the following places:

Cleveland	New York	St. Louis
Erie	Philadelphia	Cincinnati
Buffalo	Baltimore	Pittsburgh
Ottawa	Washington	St. Paul
Montreal	Atlanta	Denver
Quebec	Birmingham	Lake Superior
Boston	New Orleans	Lake Huron
Halifax	Memphis	

On this map the next list of places may best be shown by observing some of the exceptions to the rules. Write them in, observing the exceptions if you need to.

Minneapolis	Toronto	Lake Michigan
Chicago	Detroit	Lake Erie

Name these rivers, according to the rule:

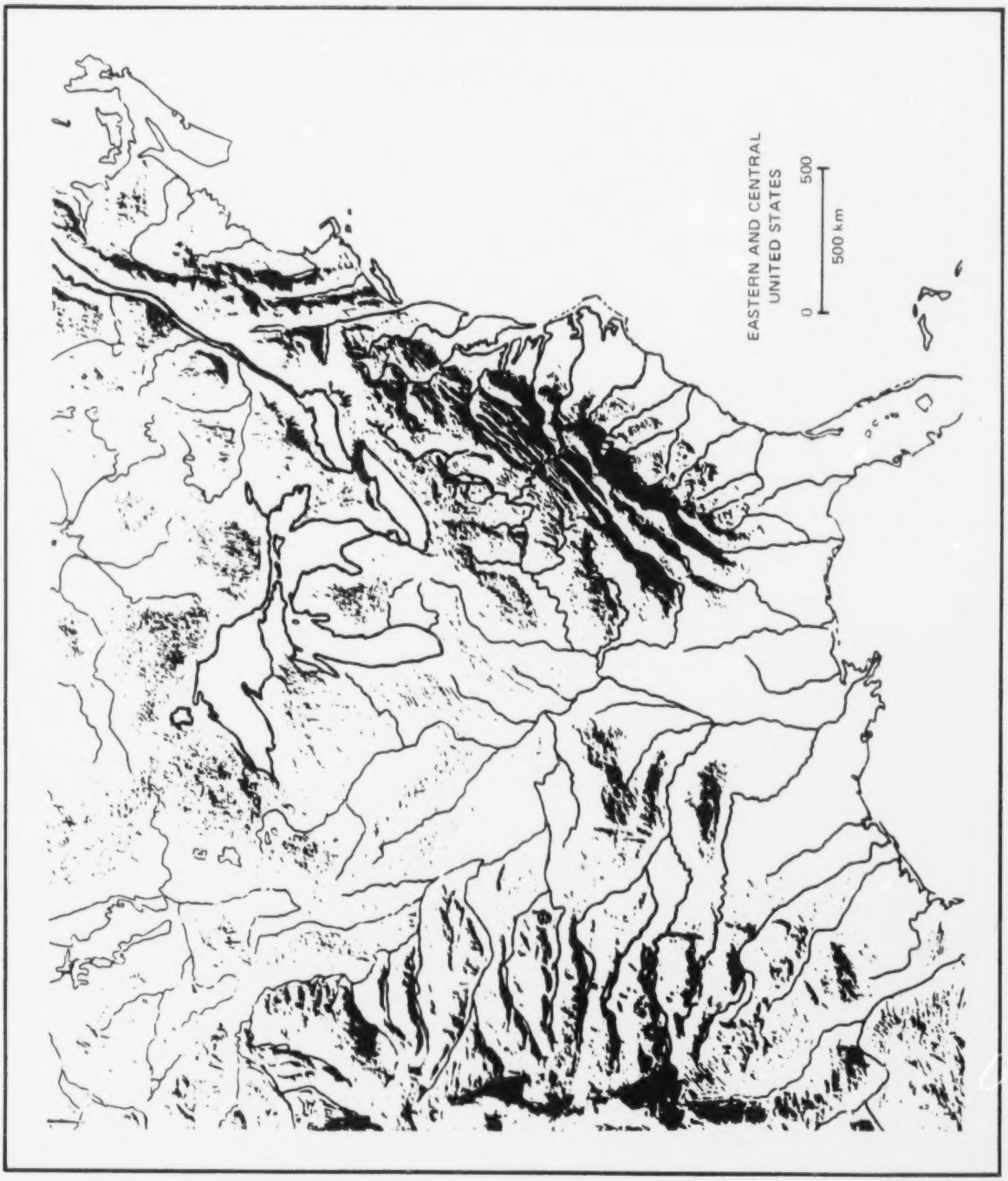
St. Lawrence	Ohio	Missouri
Hudson	Tennessee	Arkansas

Mississippi—twice; once North of the meeting with the Ohio and once South of it.

Use block letters in either pencil or ink to show the position of these features:

1. THE MISSISSIPPI BASIN
2. THE APPALACHIANS
3. FLORIDA

Label Canada and the U.S.A.



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CONTOUR LINES

Maps often show the height of the land with contour lines. Contour means 'shape'.

At the top is a sketch representing an island which rises from the sea to a height of 387 metres. The height above sea level has been marked off every hundred metres. In the first sketch shade lightly in *brown* all the island which is above 300 meteres, in *dark green* all the land below 100 metres. Then shade *light green* the land between 100 m and 200 m and *yellow* the land between 200 m and 300 m.

In the middle is a map of the same island with contour lines to show the height. Notice the highest point is marked with a cross. If you shade around the cross up to the first contour line in *brown* you will have shaded all the land which is over 300 m high. Notice it is just as wide as the brown area in the first sketch.

Contour lines go all the way around the island so you would shade all the area between the 200 m and 300 m contour lines in *yellow*. All land below 200 m should be *light green* and below 100 m *dark green*.

At the bottom is a set of height lines on which the island can be drawn as it would appear looking from the position marked '2'. The line A.B. is the same length as the line marked 0 m (sea level).

First measure the distance of the coast from the top edge of the map. It is 7mm, so mark a point along the bottom line,(0m),7mm from the left-hand edge. From the edge to the 100 m contour line is roughly 13mm, so mark a point on the 100 m line 13mm from the left edge. Join these two points and continue measuring and marking. When the shape of the island is complete it should be coloured in the same way.

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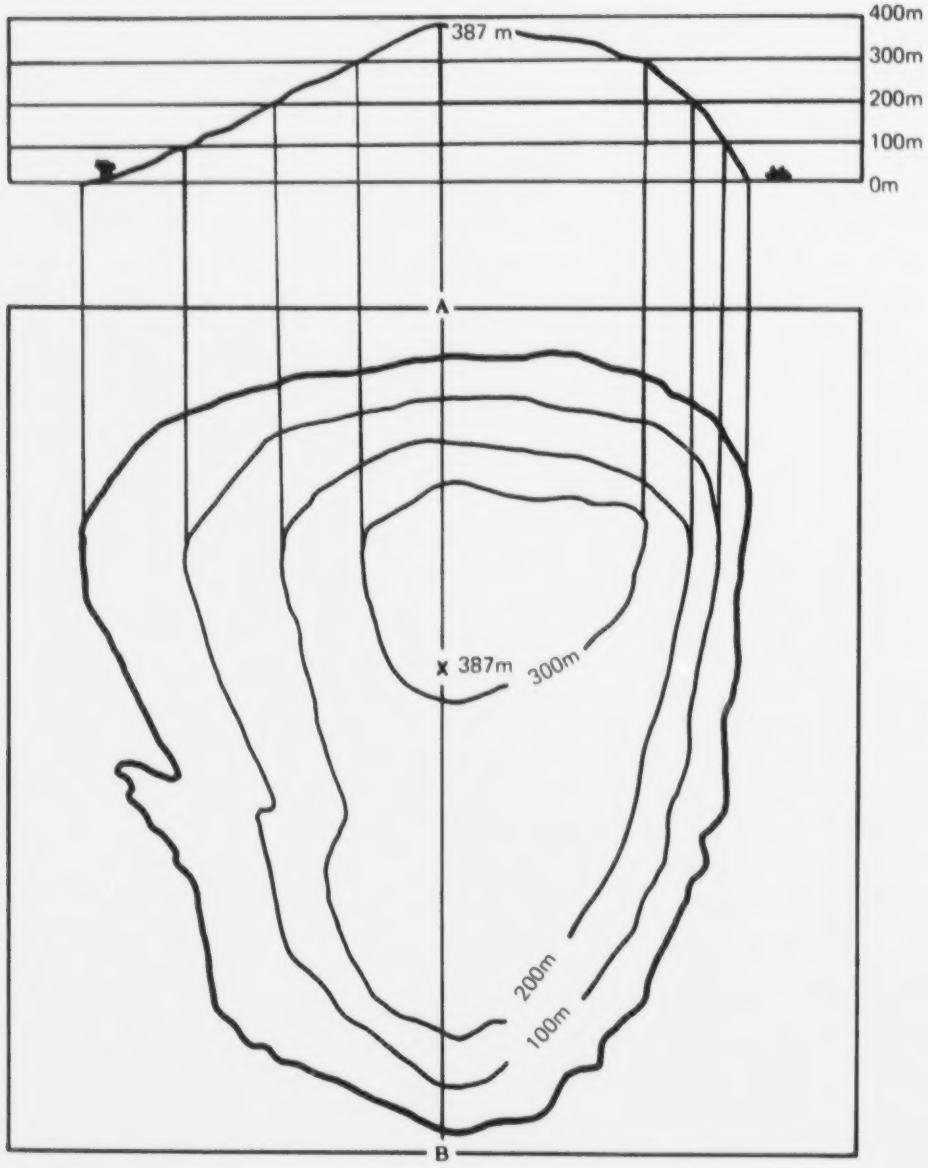
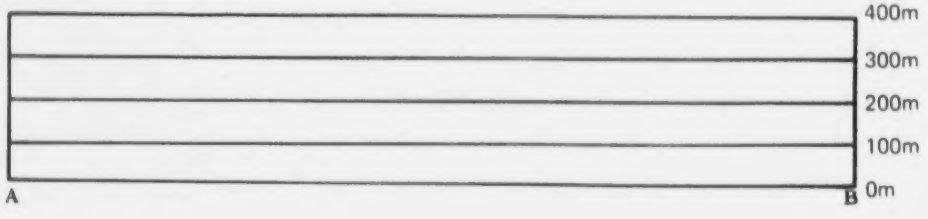
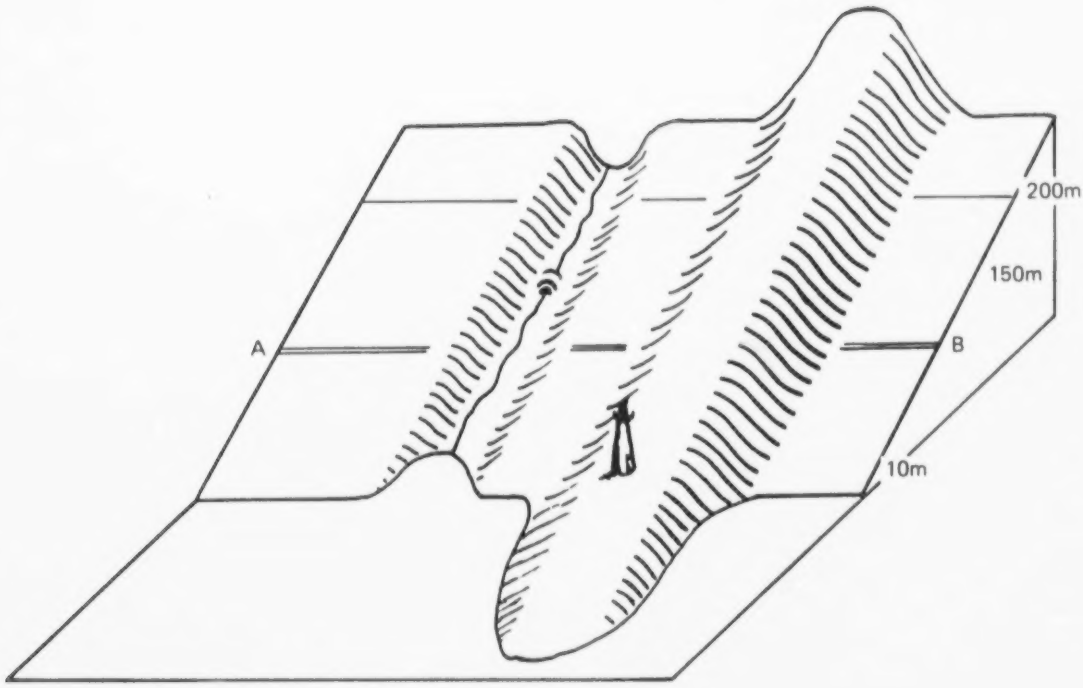

400m
300m
200m
100m
0m
387 m
A
x 387m
300m
200m
100m
B


400m
300m
200m
100m
0m
A
B

19



This sketch is of an area of land rising from the sea to a height of 250m. There is a gully 50m deep and a ridge 100m high.

1. A road is being built at 100m above sea level from A to B. Use red pencil to colour the road and complete the unmade parts so that the road is always 100m above sea level throughout its whole length. To do this it must go up the valley to the bridge and down the ridge passing in front of the lighthouse.
2. The road joins all the places 100m above sea level and a contour line does the same. Complete the 200m contour in brown going up the valley and down the ridge.
3. Now draw a contour line at 150m.
4. Shade in *blue* all the land covered at high tide, which is three metres higher.
5. Shade *green* land above high tide but below 100m, *yellow* the land between 100m and 200m, and *brown* the land above 200m.

Notice that contour lines run *up* a valley and *down* a ridge.

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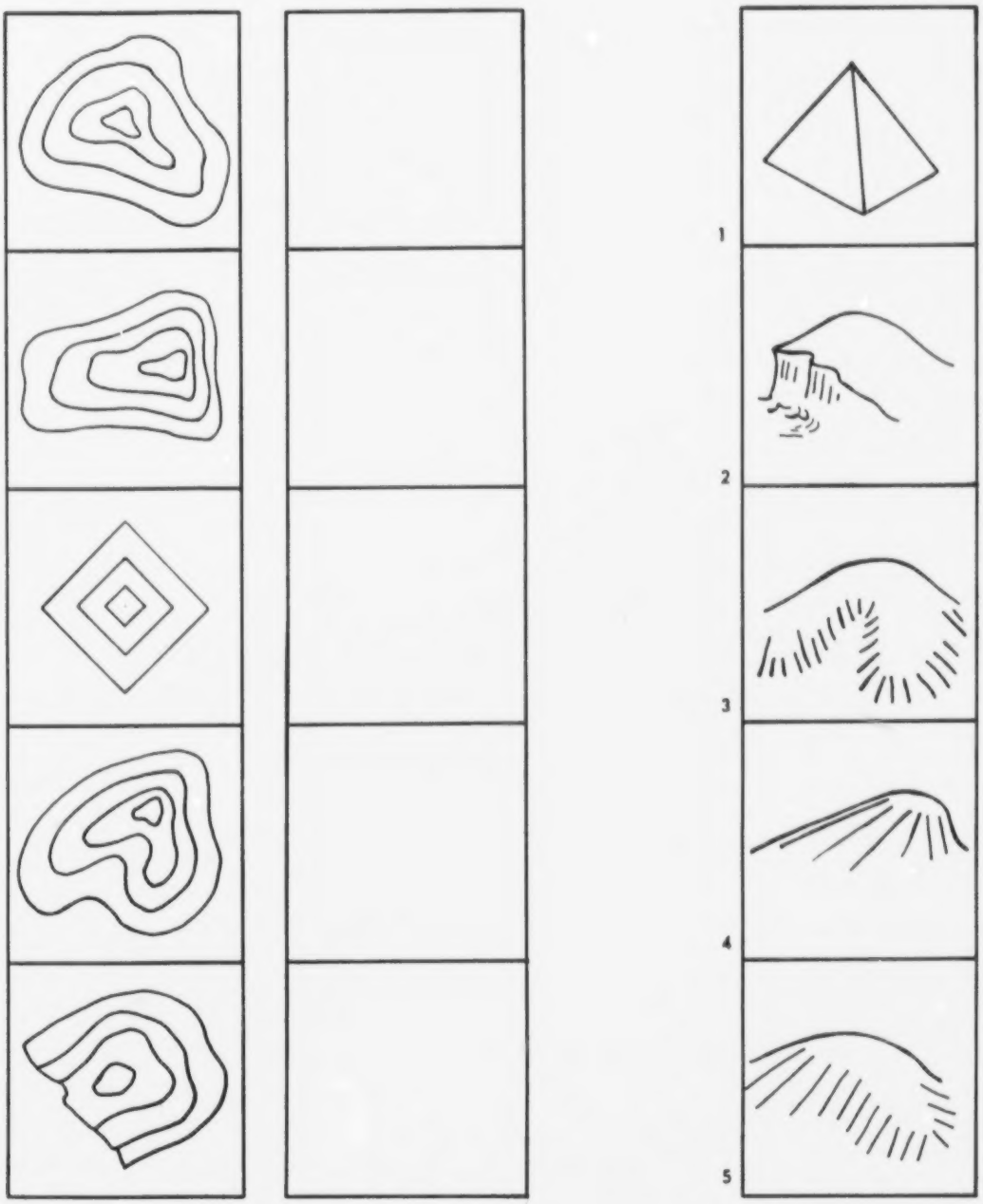
The column at the left contains five sets of contour lines and on the right are five drawings representing different land forms. Select the correct land form and draw it in the space alongside the contour. Check the answers on page 34.



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NEW TERRITORY

The territory covered in the map has a cool temperate climate. The highest points have 200cm of rainfall and the lowlands less than 63cm. Temperatures at sea level are 1°C in the coldest month and 17°C in the hottest month. Above 1000m it is too cold for trees to grow.

Imagine that this territory is unoccupied and that the government intends to open it up. Surveyors go out and first they find which land will be best for cultivation. Next they decide which is the best area for rearing cattle and sheep, then they decide which land would be best used as a forest reserve. What is left they leave as a park.

How would you divide up this territory ?

Shade the area on the map in the colours shown below and give a reason for the choice of area.

Brown – Cultivated area .....

Yellow – Cattle and sheep rearing .....

Green – Forests .....

Red – Nature reserve or park .....

Now decide where the following would be located and mark their positions in red:

1. A port
2. A large inland town
3. Three smaller towns

In the territory some minerals have been discovered: they are marked

C – Coal L – Limestone I – Iron ore

All are used for steel making. Write "S" on the map where a steel industry might be situated and give a reason for your choice.

.....

Which rivers would you use for generating electricity. Draw dams on the map and explain the choice of river and site.

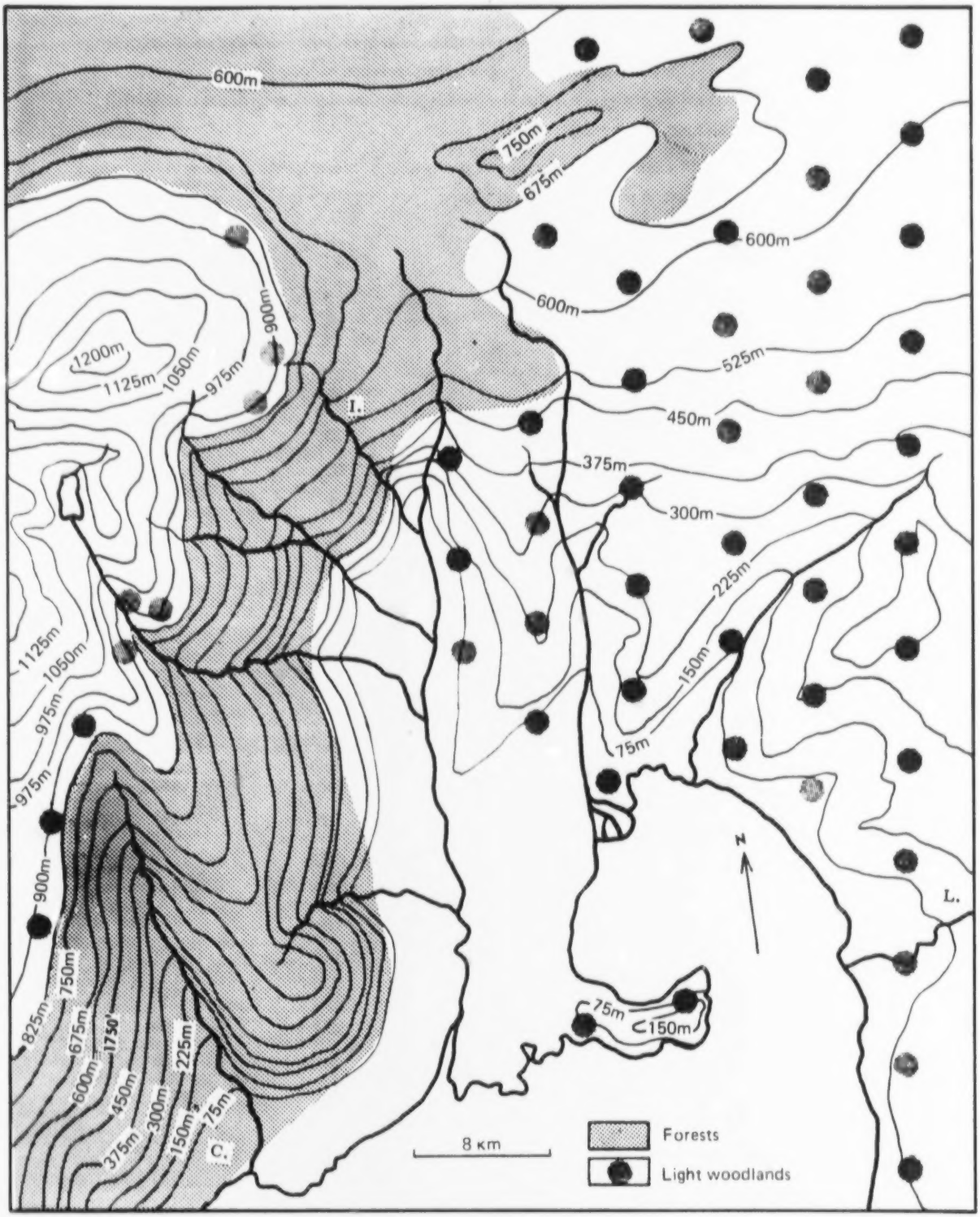
.....

A railway enters the district from the S.W. and leaves it in the N.E. corner of the map. Draw in black the easiest route it could follow and show the branch lines that would be needed.

Draw roads in *red.*

Shade with open green lines ////////////// where you would expect to find dairy farms and open blue or purple lines for farms producing vegetables for sale.

22



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GRIDS ON AN ATLAS MAP

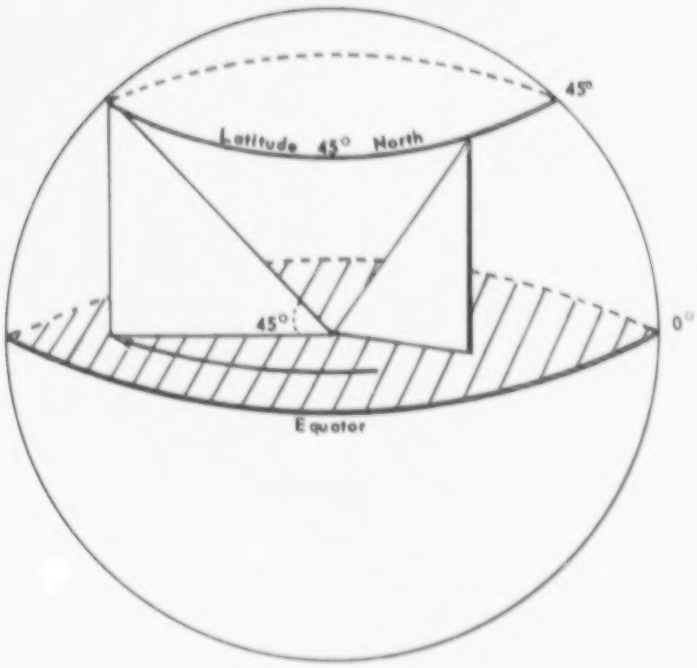
The grid on an atlas map is made up of lines of latitude running across the map and lines of longitude from top to bottom. They are numbered in degrees and places can be located in the same way as by using map references. The only difference is that the number down the side (the latitude) is given first instead of the number along the bottom.

The following are the latitudes and longitudes to the nearest degree of thirty places in Australia. Locate the places on the map and print in the initial letters:

			Lat. S.	Long. E.
Roe.	ROEBURN	–	21	117
Cn.	CARNARVON	–	25	114
Ge.	GERALDTON	–	29	115
P.	PERTH	–	32	116
C.L.	CAPE LEEUWIN	–	34	115
Al.	ALBANY	–	35	118
P.A.	PORT AUGUSTA	–	32	138
Ad.	ADELAIDE	–	35	139
M.	MELBOURNE	–	38	145
H.	HOBART	–	43	147
Ca.	CANBERRA	–	35	149
Sy.	SYDNEY	–	34	151
Br.	BRISBANE	–	27	153
Bu.	BUNDABERG	–	25	152
Ro.	ROCKHAMPTON	–	23	150
T.	TOWNSVILLE	–	19	147
Co.	COOKTOWN	–	16	145
C.Y.	CAPE YORK	–	11	143
Da.	DARWIN	–	12	131
Wy.	WYNDHAM	–	16	128
Bm.	BROOME	–	18	122
H.C.	HALLS CREEK	–	18	128
T.C.	TENNANTS CREEK	–	20	134
A.S.	ALICE SPRINGS	–	24	134
Mt. I.	MOUNT ISA	–	21	139
M.B.	MARBLE BAR	–	21	120
B.H.	BROKEN HILL	–	32	142
K.	KALGOORLIE	–	31	121
L.E.	LAKE EYRE	–	29	138
O.	OODNADATTA	–	28	136

24

25



Lines of Latitude

You have seen that lines of latitude and longitude are *numbered* in degrees. This exercise will show how the number is given.

If the earth were cut in half at the Equator the flat surface would represent the *Equatorial Plane.*

In this sketch the Equatorial Plane is shaded. Imagine a large 45° set-square placed on the plane touching the centre of the earth and turned round to scratch the surface with its tip. It would make a line parallel to the Equator and this would be Latitude 45°. A 30° set-square would make a line lower down and this would be Latitude 30°.

On the opposite page five parallels of latitude have been drawn in the Northern Hemisphere. With a protractor measure the angle marked ? and label the line of latitude which it touches *'Latitude . . . ? . . . North'*. Now draw lines from the edge of each line of latitude to the centre of the earth and measure the angles they make with the line (plane) of the Equator in the same way. Label each of the lines with the number of degrees.

In the Southern Hemisphere draw the following parallels of latitude:

15°, 30°, 45°, 60°, 75°.

To indicate which half of the world a place is in after its latitude has been given we say North or South, e.g. Lat. 15°N., Lat. 76°S. Colour the key and the two hemispheres accordingly.

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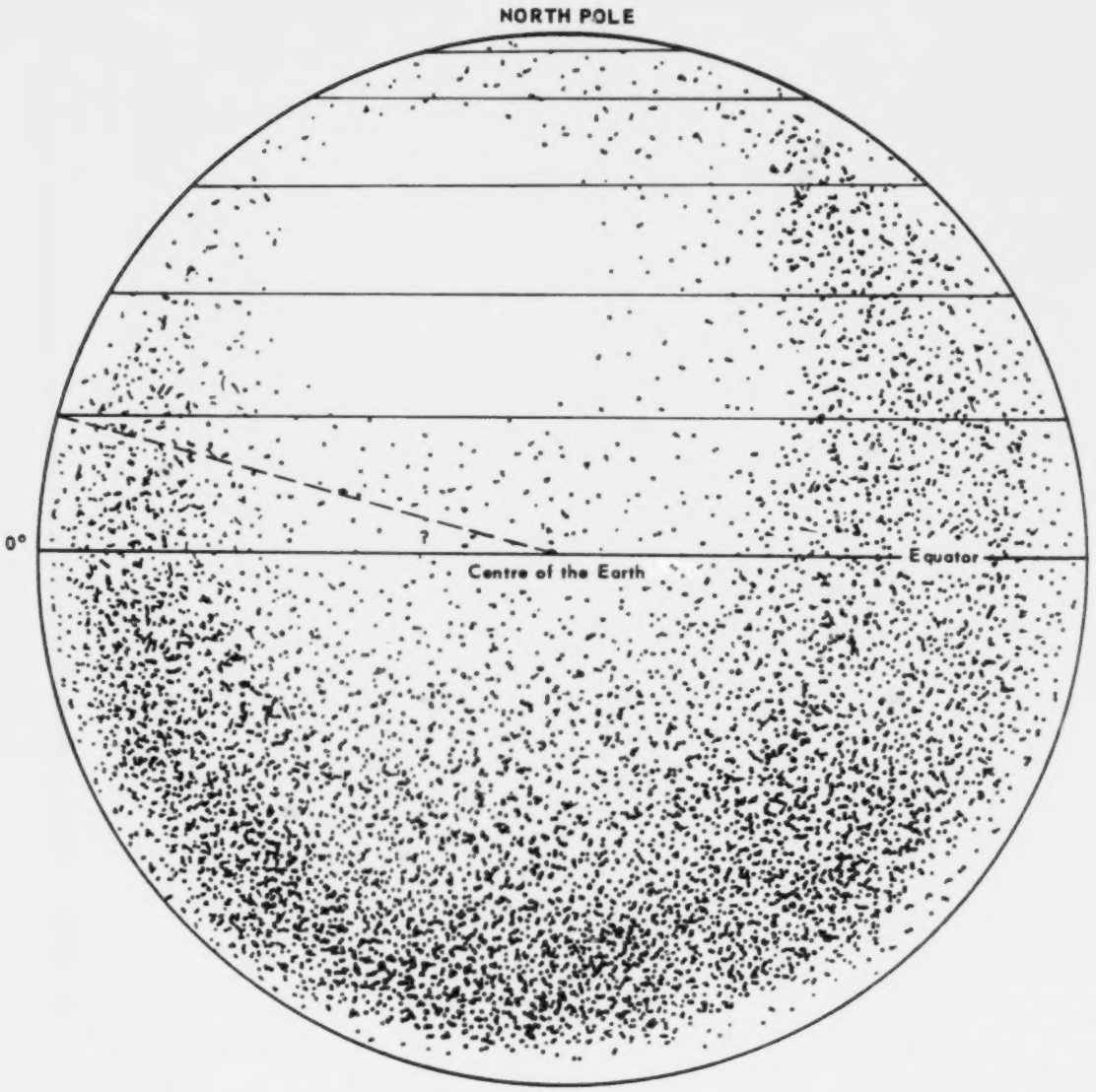


Blue — Latitudes North

Latitudes South — Red

27

Lines of Longitude

In the previous exercise we were looking at the earth from the level of the Equator. Now we are above it looking down on the North Pole. The lines of latitude go right round the earth and appear as circles.

In this exercise we shall see how the lines called Meridians of Longitude are numbered. They radiate from the Pole like the spokes of a wheel. As there are 360° around a circle there are 360° of longitude. But half are measured to the left and called 'degrees West' and half measured to the right and called 'degrees East', giving 180° both ways.

Measure the angle at the pole made by the lines 30°W and 0° and notice the angle is 30°. In the same way the meridians 60°W and 90°W denote the angle from 0° at the Pole.

The line 0° is called the Meridian of Greenwich because it passes through that part of London and at the other side of the World is 180°, the International Date-Line. Notice that lines to the left of 0° are degrees West and those to the right degrees East.

Use a protractor to mark off from 0° the lines 120°W and 150°W on the left-hand side, and then on the right-hand side the lines (meridians) 60°E, 90°E, 120°E, 150°E.

Complete the key and colour the sketch.

Notice that place A is on Lat. 30N and Long. 60W. Place B is on Lat. 60N and Long. 30W. Their location is:

A Lat. 30 N Long. 60 W

B Lat. 60 N Long. 30 W

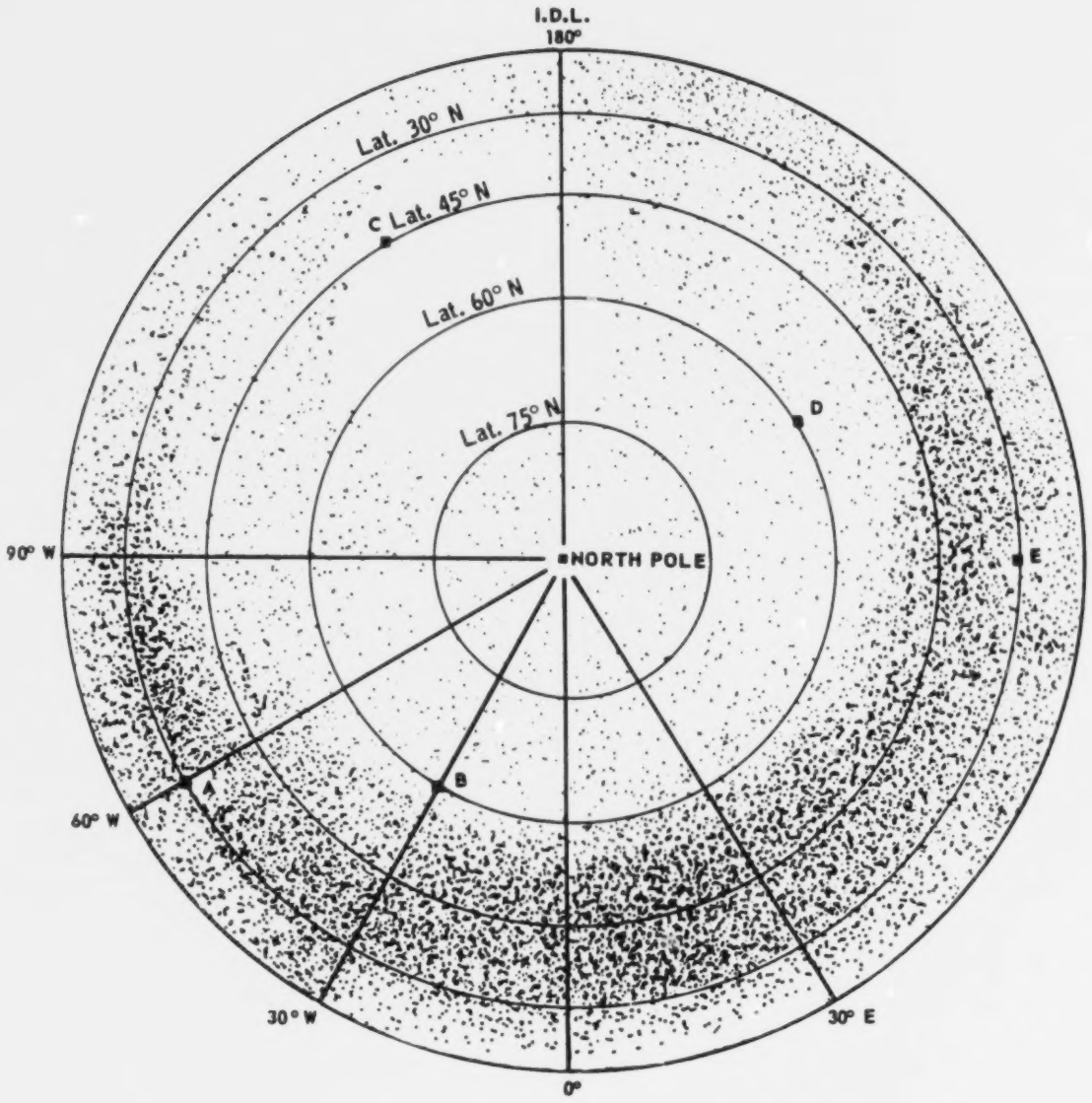
What are the locations of the following:

C Lat. ..... Long. .....

D Lat. ..... Long. .....

E Lat. ..... Long. .....

28



Yellow	Longitudes East	Green	Longitudes West

FIXING A POSITION ON THE EARTH

1. **Longitude**

Imagine you are out in space looking up at the earth and the sun. Half the earth would be dark and half light.

The earth takes twenty-four hours to make a complete turn. A person standing at A is moving round with the earth from West to East. If he looks East he can just see the sun which appears to be rising above his horizon. Let us say he is standing in Greenwich and the time is 6 am. Notice the clock showing 6 am. on the line between A and the South Pole. It is sunrise all along this *time line. Colour it red.*

In twelve hours time the earth would have made half a revolution and A would be on the *time line* from the South Pole marked 6 pm. Behind him the sun would be sinking in the West. *Mark this line purple representing sunset.*

The two coloured lines divide the earth into daylight on the right and night-time on the left. The two halves should be coloured yellow and blue. Try to keep the appearance of roundness by shading round and having the deepest colours along the lines on which the clocks show twelve midnight and twelve noon. Colour the key.

Now show the time on the clock face between 3 am. and 6 am., between 6 am. and 12 noon, and the rest of the clock faces.

Draw *time lines* at 1.30 am. and 4.30 am.

How long will it take the clock showing 3 am. to get round to the sunrise line? .....

What will be the time then on this clock? .....

What will be the time then on the Greenwich clock? .....

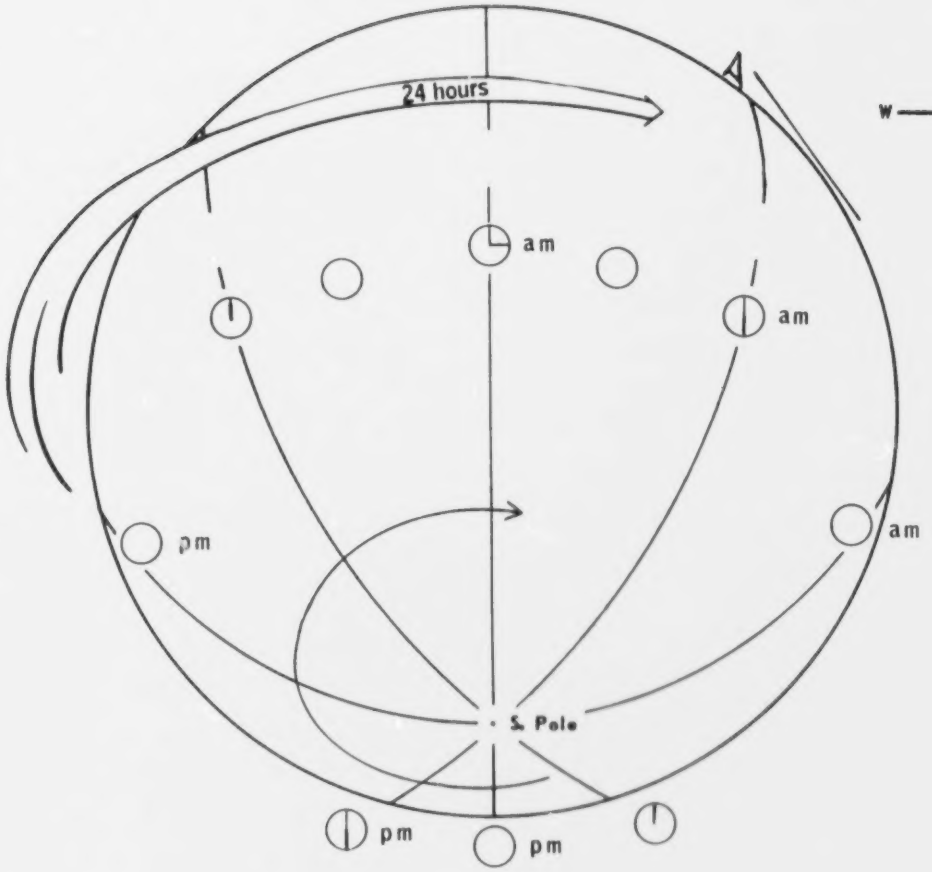
What fraction of a complete revolution has been completed in three hours? .....

Notice that on this sketch whatever local time it is around the world it is 6 am. at Greenwich. To keep this in mind draw a clock face at 6 am. above each clock from 12 midnight to 9 am. and alongside write *G.M.T.* (Greenwich Mean Time). Notice how far ahead or behind is the local time from G.M.T.

Greenwich time is used in fixing a ship's position at sea. If the sun rises at 6 am. the ship is somewhere on the line passing through Greenwich. If it rises three hours later (9 am. G.M.T.) it is on the line 3 am., or one eighth of the way round the world. If it rises at 6 pm. G.M.T. the ship is on the other side of the world.

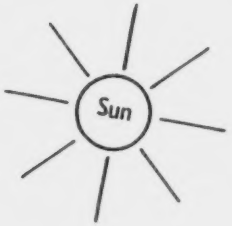
Draw as accurately as you can two time lines; the first one sixteenth of a revolution ahead of Greenwich, and the second, on which the sun rises at 1.30 pm. G.M.T.

These time lines are in fact the Meridians of longitude numbered in degrees to 180°E and 180°W.



KEY

daylight
darkness



31

31/A

2. **Latitude**

By noting the time of sunrise a navigator of a ship knows what meridian his ship is on and how far East or West of the Greenwich line his ship is. (He knows for example that his ship is an eighth of the way round the world from the Greenwich line.) He could be anywhere on the line and the next problem is to find out just where.

Let us see what happens at 12 noon when his time-line has turned so that it is facing the sun.

At the Equator the sun is right overhead. In other words the angle between the sun and the horizon is 90°. At the Poles the angle between the sun and the horizon is almost nothing or 0°.

A Sextant is an instrument, like a double telescope, which sights the sun and the horizon at the same time and measures the angle between them.

If it measures 90° at the Equator and 0° at the Poles, at 45° the ship will be half way to the Pole and at 30° a third of the way. For every 9° it is one tenth of the way towards it. How far will the following readings be towards the Pole? :

18° ..... 36° ..... 45° ..... 85½° .....

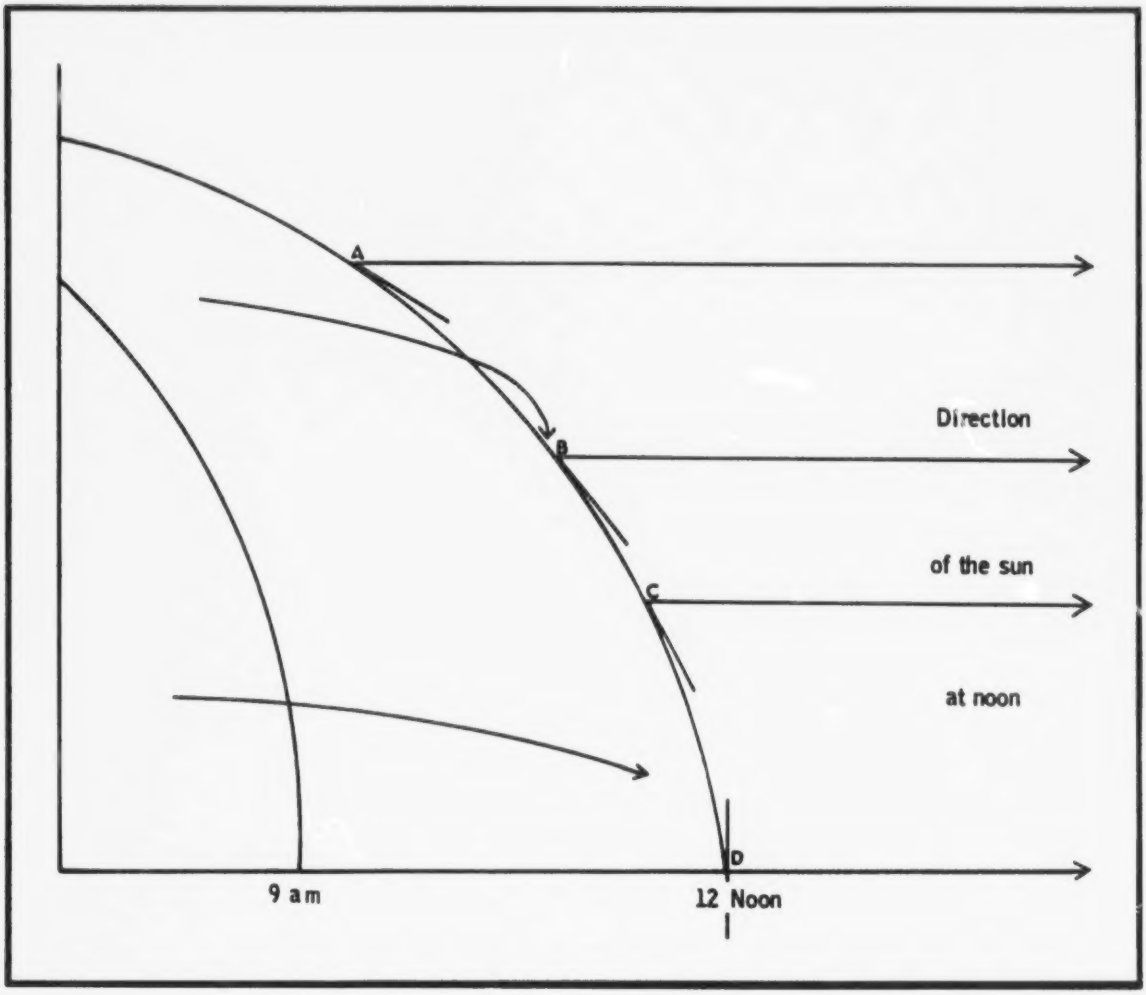
In the sketch we are closer to earth. All that can be seen is daylight. With a protractor measure and show the angles of the sun at Greenwich (A) and the three other places (B, C, D).

Try to locate approximately the following positions on the sketch with a cross:

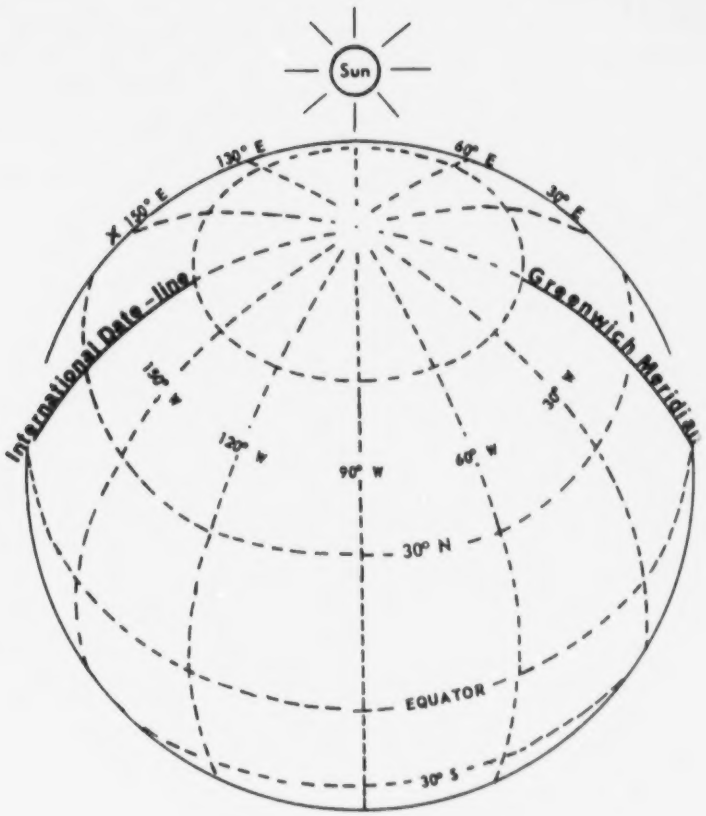
Angles between the sun and the horizon: 30° 50° 80°

From the seven angles marked on the noon line draw lines across the earth's surface curving them like the arrows. Along these lines, when they move round to noon, the angle with the sun will be the same. Print *Latitude* on them and down the 9 am. line and on the 12 noon line print *Longitude*.

32



33



Hours Ahead
Up to 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12

Hours Behind
Up to 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12

Time and Longitude

Let us say it is Friday the 21st March at Greenwich. The sun is just visible and the time is 6 am. Directly opposite the sun, at 90°E, it is noon, six hours ahead of Greenwich. 90°W is six hours behind.

Local Times

The earth turns through 360° in 24 hours, that is at the rate of 15° every hour.

Shade first the segment between the Greenwich Meridian and 30°E very lightly in red and the part of the Key representing up to 2 hours ahead in the same colour. In light blue shade behind Greenwich up to 30 W and the section of the Key labelled up to 2 hours behind, in the same colour.

Now shade between 30°E and 60°E in a slightly deeper red and in the same shade colour the second panel of the Red Key. Continue with deeper shades as far as the International Date-Line.

Notice if you sail from West to East over the International Date-Line you sail from Friday into Thursday. You lose a day sailing the other way when you sail from 6 pm. on Thursday into 6 pm Friday.

34

Position as Latitude and Longitude

How does a navigator work out his position as so many degrees of Latitude and Longitude ?

First, Degrees of Longitude

Remember the earth turns from West to East at the rate of 15° an hour. What then are the longitudes of ships which are:

1. 10 hours ahead (am) of Greenwich ? .....
2. 4 hours behind (pm) Greenwich ? .....

Now, Degrees of Latitude

Remember the Equator was Latitude	0°
The angle of the sun there was	90°
Total:	90°

The Poles are Latitude	90°
The angle of the sun there was	0°
Total:	90°

RULE: Take from 90° the angle between the sun and the horizon and the result is degrees of latitude.

e.g. Latitude 50° gives the angle 40° (50° + 40° = 90°)

What would be the angle of the sun in the following latitudes? :

60° ..... 40° ..... 30° .....

If the sun is to the South of us we must be in the Northern Hemisphere and the latitudes are Lats. North.

The following are readings taken at different days on a ship voyaging across the world. By converting the readings to latitude and longitude you can plot fairly accurately its course on the world map opposite. First work out the latitude and longitude, mark the position with a cross and then join up the crosses.

1. Angle of the sun at Noon (to the South)	54° (90–54)	=	36° N.
Time 10 hrs ahead of Greenwich	(10 x 15)	=	150° E.
2. Angle of the sun (to the South)	60°	=	
Time 10 hrs behind Greenwich	(10 x 15)	=	
3. Angle of the sun to the South	75°	=	
Time behind Greenwich	6 hrs	=	
4. Angle of the sun to the South	60°	=	
Time behind Greenwich	4 hrs	=	
5. Angle of the sun to the South	40°	=	
Time behind Greenwich	2 hrs	=	
6. Angle of the sun to the South	40°	=	
Time behind Greenwich	20 mins	=	

Consult your atlas to find the areas through which the ship passes and label them on the globe.

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NAVIGATION

When a ship's latitude and longitude has been fixed its position can be marked on a map or chart on which latitude and longitude make a grid of squares. On a ship's chart the coastline, if there is any nearby, is also shown.

Notice the lines of latitude are marked N for North and the lines of longitude W for West. They are numbered and marked in degrees (°). It is more than eighty kilometres from one degree line to the next and so the distance between each is divided into sixty parts called minutes (').

Let us imagine a navigator finds his longitude to be 5°30' West, that is half-way between 50°W and 60°W, and his latitude 50½° (50°30') N. He then takes out a chart of that area of the world and marks his position with a cross. He finds that, although he cannot see it, he is about 50 kilometres from the coast of Cornwall.

He is bound for Cardiff, marked with a C, and he plots the course he intends to sail, first N.E. to the Bristol Channel and then up the Channel. Whenever the ship alters course the position is marked with a dot and the grid reference written in. Notice the ship alters course as little as possible.

From Cardiff the ship sails to Exeter (E) calling at Swansea (S), Milford Haven (M), and Devonport (D) on the way.

Plot its course in the same way, marking the position at every change of direction.

Answers:

Page 4 – No. 3 is A
No. 1 is B
No. 5 is C
No. 4 is D
No. 2 is E

Page 5 – 3
6
4
5
2
1

Page 19 – 5
4
1
3
2

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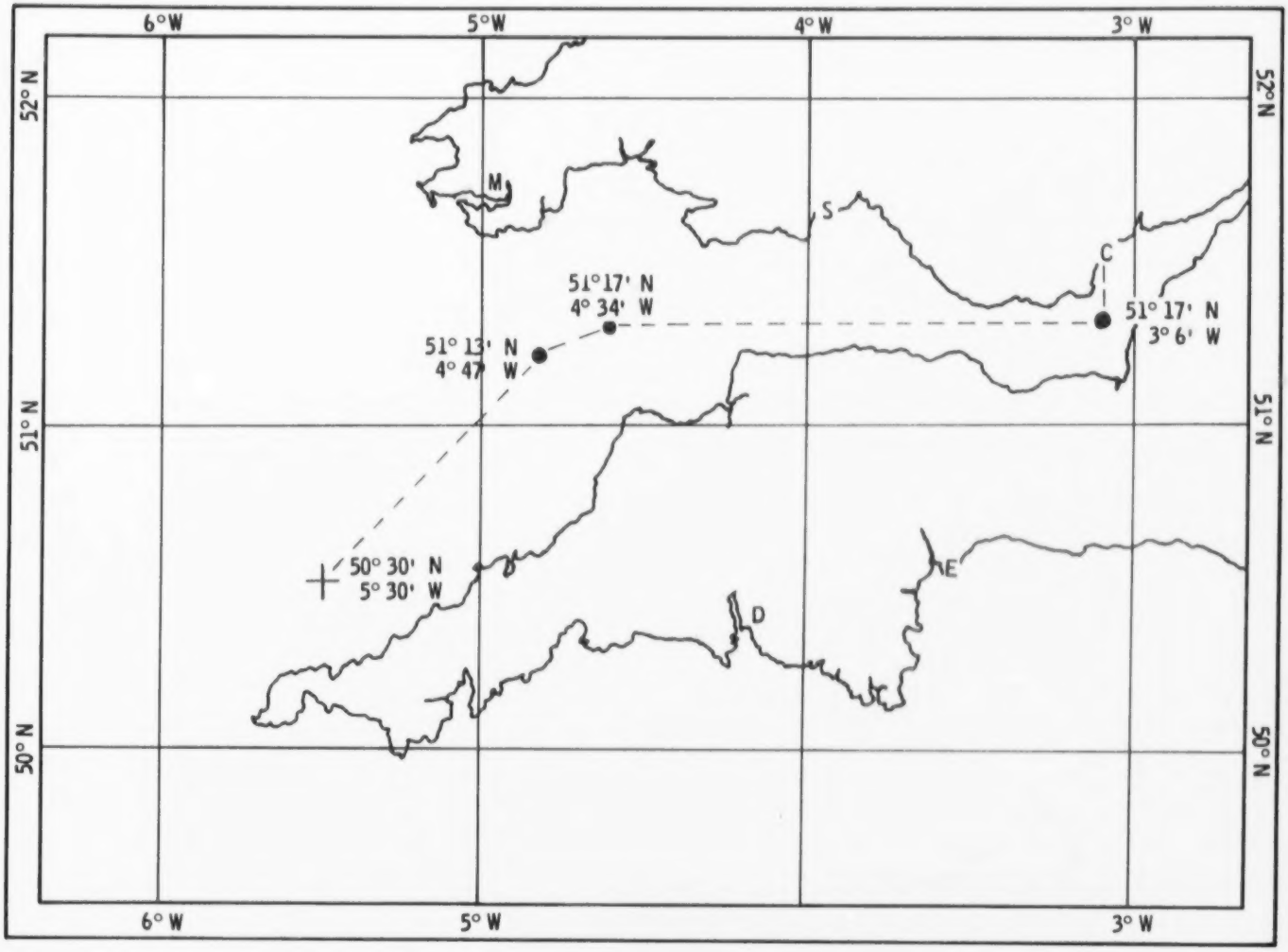

6°W
5°W
4°W
3°W
52°N
51°N
50°N
M
S
C
51°17' N
4°34' W
51°17' N
3°6' W
51°13' N
4°47' W
50°30' N
5°30' W
E
D

LOCATING PLACES FROM THE ATLAS

You will remember we have used blue, red, yellow and green to denote degrees North, South, East and West. We must now see how they fit on this map.

First find the Equator (Lat. 0°) and draw a blue line just above it and around the edge of the top half of the grid. These are Latittudes North. Enclose the bottom part of the map with a red line for Latitudes South.

The line running down the centre of the map is the Meridian of Greenwich (Long. 0°). Enclose all the map, (North and South,) to the right of this line in yellow for Longitudes East, and to the left in green for Longitudes West.

There are now four rectangles. They are :

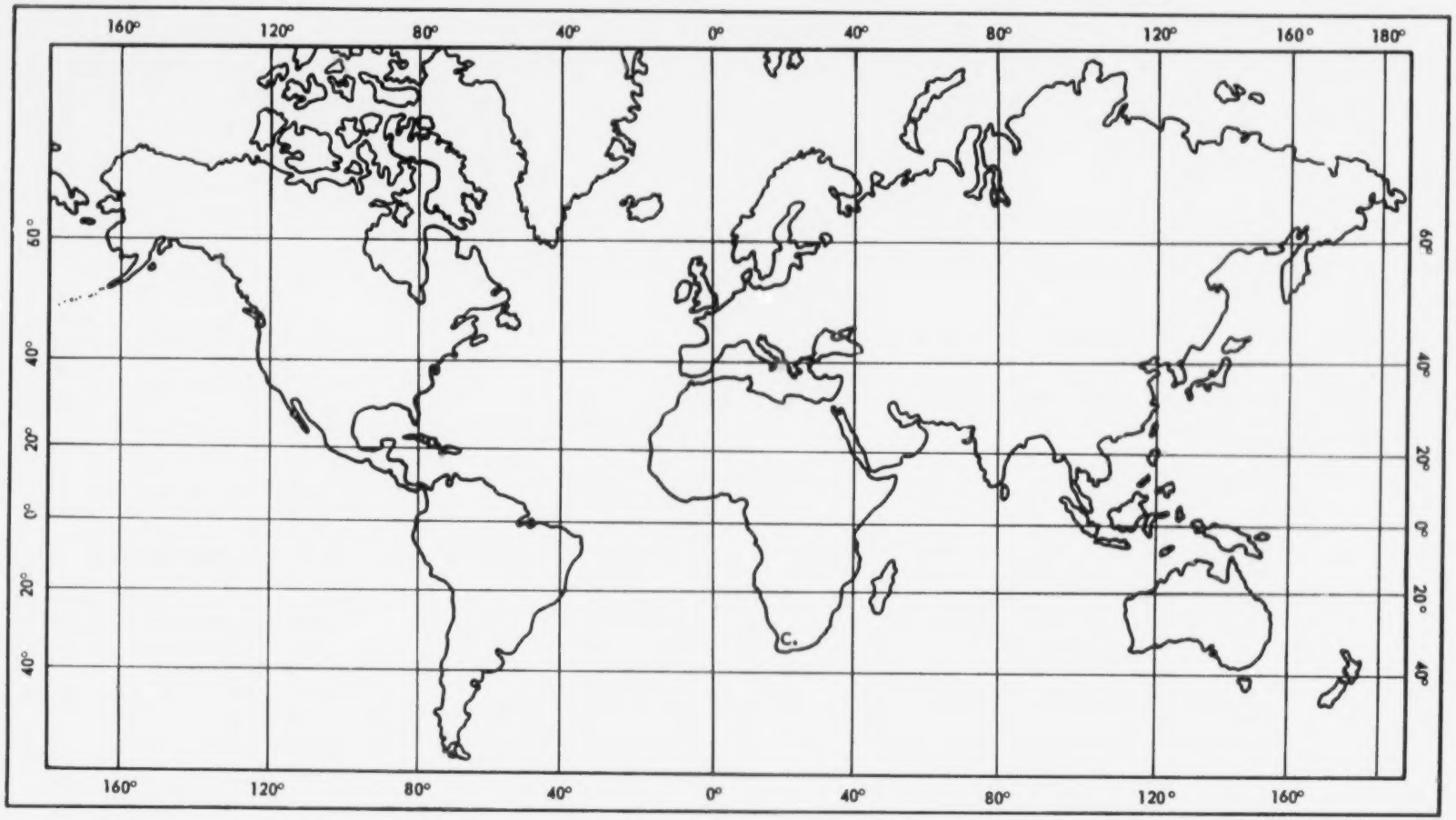
1. Latitude North, Longitude West
2. Latitude North, Longitude East
3. Latitude South, Longitude West
4. Latitude South, Longitude East

Number the rectangles 1, 2, 3, and 4.

Use the index of your atlas to find the latitude and longitude of the following places and locate them on the map with the letters given. Capetown C. (34°S. 18' E) has already been marked on the map. Note the size of the 'C'.

Accra, Goldcoast	A.	Ottawa, Canada	Ott.
Berlin, Germany	Be.	Paris, France	P.
Bogota, Colombia	Bo.	Peking, China	Pi.
Cairo, Egypt	Ca.	Quito, Equador	Q.
Chungking, China	Ch.	Salisbury, Rhodesia	S.
Mt. Everest	E.	Stockholm, Sweden	St.
Kiev, U.S.S.R.	K.	St. Louis, U.S.A.	S.L.
Lagos, Nigeria	La.	Sydney, Australia	Sy.
Leningrad, U.S.S.R.	L.	Tokyo, Japan	T.
Leopoldville, Belgian Congo	Le.	Vancouver, Canada	Va.
London, England	Lo.	Vladivostock, U.S.S.R.	Vl.
Madras, India	Ma.	Warsaw, Poland	Wr.
Moscow, U.S.S.R.	M.	Washington, D.C., U.S.A.	Wa.
Nome, Alaska	N.	Wellington, New Zealand	We.
Oslo, Norway	O.		

38



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URBAN MAPS

This is an urban map; a map of a city. It is unlikely that you know this city, so imagine you are visiting it for the first time and for a few hours only. Examine the town carefully, (it has a castle which may be hard to find) and plan a walk of about five kilometres, beginning and ending at the railway station and including as many interesting sights as you can find. Show your journey with a black dotted line, with small arrows pointing at any objects or scenes you would photograph.

Urban maps can often be interpreted in a way that will tell the story of the history of a city. This city began as a permanent settlement where routes met to cross a river. Later a castle was built on a hill on the river bank and from the castle a bridge was constructed across the river. The castle commanded the routes, and the bridge prevented shipping getting any further upstream. A medieval town grew up and its wall enclosed an area a kilometre long by three-quarters of a kilometre wide. It was a place where ships had to discharge their cargoes and it grew rich and became an important city with a cathedral and several fine parish churches.

Study the map and then outline in red :

1. The area of the castle and its surrounding walls.
2. The streets which run where the town wall once stood.
3. The Cathedral of St. Nicholas.
4. The Cathedral School.
5. The Bishop's Palace.
6. The Guildhall.
7. Three churches in the old city.
8. The Market Place.

Shade lightly in red the whole of the medieval town within the walls.

By the eighteenth century all the land inside the walls of the town was occupied by buildings and the town had expanded outside the wall in two districts: first along the waterfront where there were houses and warehouses crowded along the wharves and, secondly, in the area of the tributary stream a number of workshops using water power had made a small factory area. The town's importance attracted many travellers and near the market place large inns were constructed having great square courtyards to accommodate coaches and changes of horses.

Use green to indicate the inns, the area of warehouses and water mills.

The Nineteenth Century was a period when the town expanded rapidly. Coal was mined in the district and a railway came to the town. Coal-using factories, gasworks and steel-works were built. Those which used heavy materials were built close by the railway. Slag heaps dominated the skyline. Textile factories were not so dependent on transport. They were away from the railway and they surrounded themselves with rows of barrack-like houses in which their workers lived.

Use yellow pencil to shade over factories and workers' houses, mines, steelworks and gasworks of the nineteenth century.

In the last sixty years new housing areas with schools and churches have been developed on the outskirts of the city or on newly drained land close by. Here there is more space for living and they are served by electricity for industrial power as well as light. They are cleaner and healthier than the older parts.

Public transport and private transport make it possible for everyone to shop in the city centre. Near the bus terminus is the chief shopping district of the city where the department and chain stores are situated and where, because of the number of shoppers and people doing business in the area, sites are more valuable and buildings are close together and higher. This is the Central Business District of the whole city.

Use blue to indicate :

1. Twentieth century housing areas.
2. Electricity transmission lines and sub-station.
3. Transport terminus.
4. The C.B.D.

Complete the key, with the four colours you have used.

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